## REMARKS

Applicant has cancelled non-elected Claims 15-27 without any prejudice to filing a divisional application on the non-elected subject matter.

The high cost of energy has impacted the field of lighting and has increased a public interest in utilizing semiconductor devices such as light emitting diodes (LED's) as energy saving lighting apparatus over that of incandescent and halogen lamps.

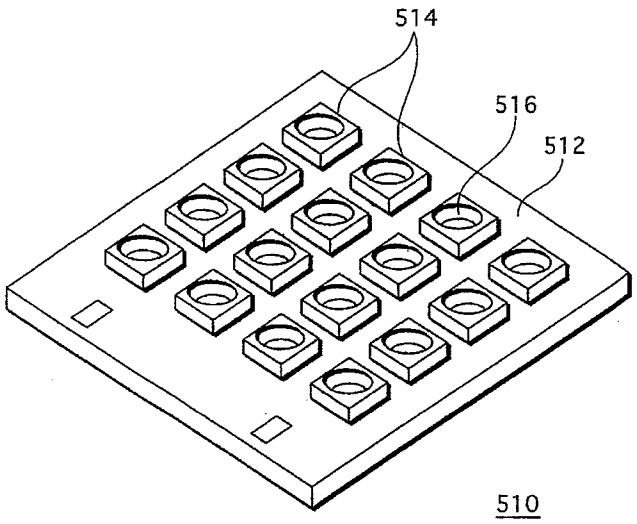
To provide an adequate amount of light by using an array of LED's, they must be combined on a substrate and an appropriate phosphor is provided to help convert the radiation from the LED into white light for utilization. There is still a desire, however, to maximize the light efficiency from the resulting LED mounting module while resolving problems that can be generated by the distortion of heat on a compact array of LED chips.

Our present invention includes an LED mounting module with a substrate that can comprise a composite material, of an inorganic filler and an epoxy resin. The epoxy resin can, for example, be a thermo-setting resin material to provide a structure to not only remove heat but to properly arrange an array of LED chips and facilitate power connections such as a wiring pattern on one of the main surfaces of a substrate.

Additionally, separate reflecting pieces are juxtapositioned around the LED base chips for collecting and directing light. The reflecting member also can include a thermo-setting resin material such as an epoxy resin and appropriate fillers to reflect light.

By using a compatible thermo-setting resin as a component in the substrate and in the reflecting pieces, it is possible to directly adhere the individual reflecting members to the substrate, for example in a partially cured state so that they are bonded by direct contact for example in such a design as set forth in Figure 20 as follows:

FIG.20




One of the advantages of this specific design can be found as follows in Paragraph 0307:

> The separate reflecting pieces (514, 534 and 914) have an advantage that less distortion is caused in the reflecting member and the printed wiring board by heat, when compared with the reflecting board 126 relating to the first embodiment, for example. Such distortion is caused due to a difference in thermal expansion coefficient between materials forming the reflecting member and the printed wiring board.

Our specification further describes our individual reflecting pieces as follows in Paragraph 0184:

> As clearly seen from FIG. 20, each reflecting piece 514 has a reflecting hole 516 in its center. In other words, one reflecting piece 514 has one reflecting hole 516. The reflecting hole 516 is tapered downward towards the printed wiring board 512 in the same manner as in the first embodiment. Specifically speaking, the reflecting piece 514 made of a resin material in a half-cured state is first placed at a predetermined location on the printed wiring board 512. After this, while a pressure is applied to a front surface of the reflecting piece 514, the reflecting piece 514 is heated, to be completely cured.

Thus, our present invention, by providing a plurality of individual reflecting members having a compatible resin material to that of the substrate permits the reflecting members to be directly adhered to the substrate and it is possible to avoid heat distortion caused by a difference in thermal expansion coefficients between materials forming the reflecting member and the printed wiring board feature of the substrate.

Additionally, the number of reflecting members can be adjusted since they are generic, and alterations in an automatic manufacturing process of delivering such components and attaching them can be appropriately programmed for quick modification of the production line.

As can be appreciated, this is a technological field with relatively large companies with skilled scientists and engineers competing to seek advantages that result in lower costs. These factors should be taken into consideration when evaluating the patentability of the current unique claims.

> "Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light."
>
> *Continental Can Co. USA Inc. v. Monsanto Co.*, 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

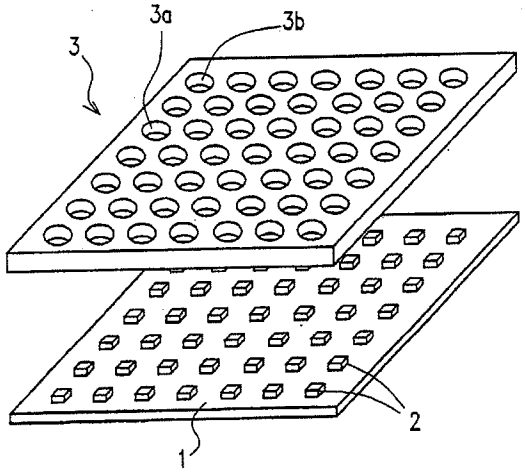
The Office Action rejected Claims 1-14 as being anticipated by *Shimizu et al.* (U.S. Patent Publication 2003/0189829) under 35 U.S.C. §102(e).

The *Shimizu et al.* reference is assigned to the present applicant, Matsushita Electric Industrial Co. Ltd., and is directed to a concept of employing a card-type LED illumination source that purportedly would solve the problem of deterioration of heat on the expected life of an array of LED bare chips.

As noted in Paragraph 0011, an increase in temperature of 10°C would cut the life of an LED bare chip by one half. A solution was to provide a removable card type LED source utilizing a substrate of a metal base with an overlay of an insulating layer. The back surface of the metal substrate is mounted onto a heat sink of a thermal conductive member having an equal or greater area than the card mounting LED's. The utilization of this card approach also permits a replacement of a defective or spent card with a new card to thereby maintain the utility of the illumination apparatus. See Paragraph 0085.

Basically, the *Shimizu et al.* reference teaches a substrate 1 with a plurality of LED's 2, flip chip mounted on the substrate, and then covered with an optical reflector plate 3 with openings to surround the LED bare chips, as shown in Figure 4a:

*FIG. 4(a)*




As noted in the Office Action, the substrate 1 includes a metal plate 1b shown in Figure 5a and insulating layers 1c (and 1e). The insulating layer is bonded to the metal plate and the optical reflector 3 is utilized in a sandwiched manner to purportedly distribute the heat uniformly

across the heat dissipating substrate 1, thereby preventing heat from being concentrated at the center of the heat dissipating substrate. See Paragraph 0138.

As disclosed in Paragraph 0169, the metal plate and the optical reflector are made of a common material in order to address any thermal expansion.

> "An anticipating reference must describe the patented subject matter with sufficient clarity and detail to establish that the subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the invention." *See In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990); *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 678, 7 USPQ2d 1315, 1317 (Fed. Cir. 1988).

The *Shimizu et al.* reference is not an anticipatory reference since it proposes a laminate sandwich of basically an optically reflecting plate with a series of holes that is to be bonded to a substrate that can be a laminate with a metal base plate, preferably of the same material, for addressing the dissipation of heat which is one of the principal features of the *Shimizu et al.* disclosure.

> A prior art reference must be considered in its entirety, i.e., as a <u>whole</u>, including portions that would be lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Referring to our amended Claim 1, we specifically define a plurality of reflecting members which are made of a resin material and having a reflecting hole. Our reflecting members are directly adhered to the substrate which can be accomplished by having a half cured reflecting piece pressured onto the substrate and cured to adhere, for example to a printed wiring board, as noted above in Paragraph 0184. The reflective members are each a separate unit.

In our invention, the reflecting members are individually formed of a resin material and any heat generated from a light emitting LED's that can cause distortion in the substrate and the

reflecting member due to heat, can be minimized by the use of a plurality of individual reflecting members, each separately attached to the substrate.

The *Shimizu et al.* reference, when reviewed as a whole and considering its most favorable teaching, that is when the substrate and the reflecting member are from the same material so that their thermal expansion coefficients remain the same, will still have problems and the larger the size of the reflecting member is in order to facilitate the manufacturing of the card-like module, the more warp that can occur between the reflecting member and the substrate.

In our present invention, as defined in our amended Claim 1, a plurality of individual reflecting members are made of a resin material and are separately formed. As a consequence, any stresses caused by a thermal expansion are relatively relaxed so that the reflecting members adhered to the surface of the substrate do not come off and that the warp of the reflecting member, if any, is thereby reduced. As a result, an LED mounting module of good quality and production yields can be obtained.

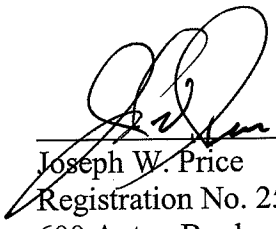
The *Shimizu et al.* reference cited in the Office Action, as can be seen from the various figures such as Figure 1a, Figure 4a and Figure 12, teach a reflecting plate having multiple holes as an integrated unit. There is no teaching of a plurality of reflecting members separately formed and adhered separately to one substrate.

In view of the close and crowded technology field of this invention, it is believed that our amended claims more than adequately define over the cited reference.

If the Examiner believes a telephone interview will help further the prosecution of this case, he can contact the undersigned attorney at the listed telephone number.

Very truly yours,

**SNELL & WILMER L.L.P.**



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